THE SCHOBER REVERBATAPE® UNIT RV-3A

ASSEMBLY INSTRUCTIONS

This kit contains the following parts. If any are missing or damaged, replacements will be sent on request.

QUAN	DESCRIPTION	NUMBER
5	100-ohm resistors	011101
5	1,000-ohm resistors	011102
5	10,000-ohm resistors	011103
7	100,000-ohm resistors	011104
~~1~~	~~120-ohm resistor~~	011121
3	12,000-ohm resistors	011123
7	15,000-ohm resistors	011153
2	18,000-ohm resistors	011183
5	2,200-ohm resistors	011222
4	22,000-ohm resistors	011223
1	220,000-ohm resistor	011224
3	27,000-ohm resistors	011273
1	270,000-ohm resistor	011274
1	330-ohm resistor	011331
3	3,300-ohm resistors	011332
3	33,000-ohm resistors	011333
~~1~~	~~3,900-ohm resistor~~	011392
~~2~~	~~39,000-ohm resistors~~	011393
1	390,000-ohm resistor	011394
1	470-ohm resistor	011471
4	4,700-ohm resistors	011472
3	47,000-ohm resistors	011473
1	470,000-ohm resistor	011474
1	56,000-ohm resistor	011563
1	560,000-ohm resistor	011564
~~1~~	~~68-ohm, 1-watt resistor~~	013680
1	68,000-ohm resistor	011683
1	82,000-ohm resistor	011823
12	5-mfd, 50-volt electrolytic capacitors 4.7	0250301
2	25-mfd, 10-volt electrolytic capacitors 22	0250308
1	50-mfd, 25-volt electrolytic capacitor	0250305
1	250-mfd, 25-volt electrolytic capacitor	02509
3	250-mfd, 3-volt electrolytic capacitors	0250306
4	225-mfd, 10-volt electrolytic capacitors	0250307
2	500-mfd, 50-volt electrolytic capacitors	02507
~~1~~	~~.0015-mfd mylar capacitor~~	0281152
1	.047-mfd mylar capacitor	0281473
3	.0068-mfd mylar capacitors	0281682
2	.068-mfd mylar capacitors	0281683
1	.001-mfd disc capacitor	020102
1	.002-mfd disc capacitor	020202
4	.003-mfd disc capacitors	020302
1	.005-mfd disc capacitor	020502
~~11~~	~~Special transistors, red-marked~~	046127R
2	2N2102 transistors	042102
13	Transistor sockets	1803
~~1~~	~~2N2148 transistor~~	042148
1	30-volt zener diode	04IR30B
4	Silicon rectifiers	04D200
2	25,000-ohm miniature potentiometers	014253A
3	7,500-ohm miniature potentiometers, packed in small envelope inside mechanism. **WARNING: Do not rotate serrated wheels of these units.**	014752A
1	4,000-ohm miniature potentiometer	014402A
1	Oscillator transformer	0319
1	Printed circuit board	11110A
24	Tubular terminals	08801
1	7-pin socket	1822
1	Double phono jack	10103
1	Triple potentiometer	017104RV
1	7-pin male plug	1807
1	Rubber cap for above plug	1807C
5	13/16-inch-long threaded tubular spacers	0845
2	1/4-inch-long tubular spacers	0841
4	5/8-inch-long tubular spacers	0844
1	17/32-inch-long tubular spacer	0846
5	6-32 x ¼ round-head machine screws	08131
7	6-32 x ½ round-head machine screws	08133
4	6-32 x 1 round-head machine screws	08137
1	6-32 x 7/8 self-tapping screw	08013
12	No. 6 internal-tooth lockwashers	0832
6	6-32 hex nuts	0823
10	Terminal clips for magnetic head prongs	10104
1′	No. 22 bare wire	07322
1′	No. 28 brown wire	07201
4′	No. 28 green wire	07205
4′	Single-conductor shielded cable	07604
6′	6-wire shielded cable	07605

Preliminary Data

This instruction manual shows you, in step by step fashion, how to assemble your Reverbatape Unit. Other literature tells you how to install it on any organ and what to do if trouble develops, and also gives a complete technical explanation of how the Unit works. This model RV-3A is essentially identical to the RV-3; it has a few small improvements in a section or two, but technical explanations of the RV-3 may be taken almost entirely as correct explanations of the 3A.

A complete and correct schematic diagram of the RV-3A is included in the Service Manual, which accompanies your kit. You need not understand it, and you must not use it as a guide for kit assembly in lieu of the instruction steps. The diagram (and photos) in the "how-it-works" article which also accompanies the kit may not be 100% correct, though any differences are not enough to obscure the technical explanation of how the Reverbatape Unit works for those sufficiently well qualified technically to read it and understand it thoroughly. This technical background is included purely to satisfy the curiousity of technical people.

Please read all the following preliminary data to be sure you will understand exactly what is required so that you will assemble your Reverbatape Unit correctly.

The word "Reverbatape" is a registered trademark of The Schober Organ Corporation, and may not be used to describe any other product.

The Schober Organ Corporation warrants all electronic parts to be mounted on the printed circuit for 5 years from date of shipment and will replace any part which is or becomes defective within that period unless the defect is, in Schober's judgement, due to misuse or failure to follow any Schober instructions. Parts to be replaced should be returned with transportation prepaid. A letter must be sent separately or attached to the outside of the package requesting a new part and detailing as far as possible the trouble with the original one. After expiration of the guarantee, a nominal charge may be made for any necessary replacements.

Tools Required

Only ordinary hand tools are necessary. These should include two or three screwdrivers of different sizes, long-nose pliers, diagonal wire-cutting pliers, a half-inch and a quarter-inch nutdriver, and gas or "slip-joint" pliers. Other small tools may come in handy if you have them.

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You will need solder and a soldering iron. The solder *must* be Ersin Multicore, 60/40, preferably No. 16 wire gauge. The soldering iron *must* be an Ungar No. 776 handle, plus No. 1235 37½-watt heating element and No. PL333 tip. Both may be bought locally, or they may be ordered from Schober (see items IR-1 and SO-1 on the Schober price list).

Warning: If you do not use the exact solder and soldering iron listed in the above paragraph, our guarantee on the printed circuit may be voided. With the listed equipment you will have no trouble whatever with the printed circuit; with a substitute, no matter how close it may be to the prescribed item, you risk damaging the printed board. If you do, we will replace a board (and any necessary components on it) only at full charges.

You need only a small working area. A card table or a kitchen table with a nearby electrical outlet is sufficient.

Following Instructions

It is absolutely essential that you follow each instruction as you assemble the Reverbatape Unit, no matter how much you may know about electronics. The instructions are written and illustrated in such a way that nothing is left to your imagination and no previous knowledge is assumed. They tell you how to do everything that must be done, and specify the sequence of doing it. Our guarantee is valid only if you have followed all instructions as given and in sequence.

If any instruction or operation is not clear to you, don't guess! Write or phone for clarification.

Identifying The Parts

Most of the parts in the kit will be identified when you come to them in the instructions. However, certain parts are identified here.

Resistors. All resistors are cylindrical, with a wire coming from each end. All but one are ⅛ inch in diameter and ⅜ inch long. The one exception is a 1-watt resistor which is about ¼ inch in diameter and 9/16 inch long.

The electrical value of a resistor in ohms is marked on each resistor with a color-coded set of rings. Ten colors are used, each representing a number from 0 through 9. The following table spells out the code:

1 – Brown	6 – Blue
2 – Red	7 – Purple
3 – Orange	8 – Gray
4 – Yellow	9 – White
5 – Green	0 – Black

Each resistor has four rings, as illustrated in Fig. 1. The *first* ring is that nearest one end of the resistor, and it is one

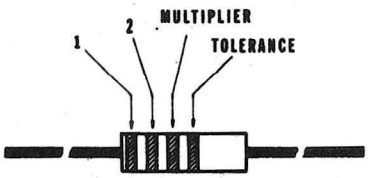


Fig. 1–Resistor color code. Rings 1 and 2 are first two digits of resistance value; third (multiplier) ring gives number of zeroes to be added. Tolerance ring can be ignored.

of the colors listed above. The last ring is gold or silver and in this kit it is ignored. There are thus three rings of significance and they are read in order. If the ring marked 1 in Fig. 1 were red, the one marked 2 were purple, and the third were orange, the colors would be recited: "red-purple-orange."

The first two colors represent the first two significant figures of the resistance value. If you were writing down the value of this resistor, therefore, you would write: "27," to correspond with the first two colors, which were red and purple.

The third color does *not* represent the next digit. It shows *the number of zeroes* which follow the two digits just written. Since the final color of the above resistor was orange, meaning 3, three zeroes must follow the first two digits, so that the final value becomes 27 + 000, or 27,000.

Example 1: A resistor has rings brown-black-red, meaning 1-0-2. The value is 1, followed by 0, followed by *two zeroes,* or 1,000.

Example 2: You are told to find a 680-ohm resistor. That resistor will have rings standing for the numerals 6-8-1. (Remember that the final "1" does not represent the numeral 1, but the number of zeroes following the first two numerals.) The correct resistor therefore has rings blue-gray-brown.

In determining how many zeroes there are at the end of the value, do not simply count the zeroes. Count only those zeroes which come *after the first two digits.* Thus, the value 1,000 ohms does *not* have three zeroes for color-code purposes; it has only two *following the first pair of digits.* The first of the zeroes in the actual number is represented by the actual color (black) standing for zero; thus: brown-black-red.

To be quite sure you understand this system, place all the resistors in a pile. Referring to the parts list on page 1, find each resistor called for and transfer it to a second pile. When you have nothing left in the first pile you should have exhausted the resistors in the list. If you think you have found resistors of values not listed, you probably have not understood the color code and should study it again.

To make resistor identification still more unmistakable, the part number of each one, listed in the right column of the parts list, shows the colors for you. Notice that for the 120-ohm resistor, for example, the *last three digits* of the part number are 121. These are the colors which appear on the 120-ohm resistor: brown-red-brown.

If you now are capable of making a mistake, you should volunteer to stand in the corner for at least an hour and go without supper.

One warning. A few people are wholly or partially color blind. If you are in this category, don't be too proud to have someone else identify and tag each resistor in advance. In any event, if you are new to the color code check yourself twice each time you install a resistor. A wrong value will result in unsatisfactory Reverbatape operation and will puzzle us when you ask for help; we do expect you to put the right parts in the right places!

Capacitors. There are three types of capacitors in this kit. The electrolytic type is a cylinder of metal, covered with insulating material, or entirely of plastic. A wire comes from each end. Electrolytic capacitors have values greater than 1 mfd, not decimal values. One end is marked POSITIVE or +, and the instructions always tell you which way the unit must be turned with respect to that marking. It is vital that you pay attention to this point.

A second capacitor is a disc with two wires. The wires are usually very short and have been squeezed flat. When you place these wires into the designated holes in the printed circuit board, they generally will stay there until soldered, without further attention.

The last capacitor type is the dipped mylar. The outline is rectangular and they are somewhat flattened, with a somewhat irregular appearance.

Electrical values are always printed on capacitors. There is usually other matter also printed on them. Simply look for

the number specified in the instruction and ignore all other numbers and letters you may find on the capacitors.

Hardware. There are four different kinds of screws in the kit. They are all different in length—measured along the body of the screw, ignoring the head—so identify them solely by length, ignoring all other characteristics.

Tubular spacers are metal cylinders of about ¼ inch outer diameter. Identify them simply by length.

Lockwashers are rings with inner serrations.

The Printed Circuit

The printed circuit is the large flat object identified by the number 11110. On one face there is a pattern of metallic lines, circles, and markings. This is the *copper side.* On the other side there are many rectangular outlines, plus numbering and lettering in special ink or paint, but without any metal. This is the *painted side.* These identifications of the two sides of the board are very important to remember.

Location Grid. Looking at your board and Fig. 2, which is a reproduction of the painted side, notice that along the left edge there are letters T through Z in circles. Along the lower edge there are numbers 1 through 9 in circles. The letters and numbers are a map-type grid coordinate system making it easier to find the various components.

For example, suppose you want to find the rectangle labeled 2 and you are told it is at location Y-4. Draw an imaginary line rightward from Y and another upward from 4. Where the two intersect you will find outline 2. Naturally, every location cannot be directly at the intersection of such lines, so in most cases you must still look around a bit. However, the area over which you have to look is small, and you will save a good deal of the time and frustration to be expected if this grid coordinate system did not exist.

Fig. 3 is a reproduction of the copper side of the board.

Printed Circuit Soldering

If you are unfamiliar with soldering, you should request a Schober How-To-Solder Kit, which will teach you what you need to know. It is free of charge.

Remember that you *must* use the Ungar iron and Ersin solder specified on page 2. Wipe the tip of the iron whenever it has dark-colored flux on it. Use only paper or a rag, never anything abrasive.

Identifying Component Locations. The holes through which component wires are to be passed when installing them are marked on the board in two ways. On the copper side, the markings are as shown in Fig. 4, the exact method depending on the available space. These numbers, dots, and small reference lines are actually in metal. The markings on the copper side are mainly for future use in case you have to unsolder a component to replace it.

The markings you should use for kit assembly are on the

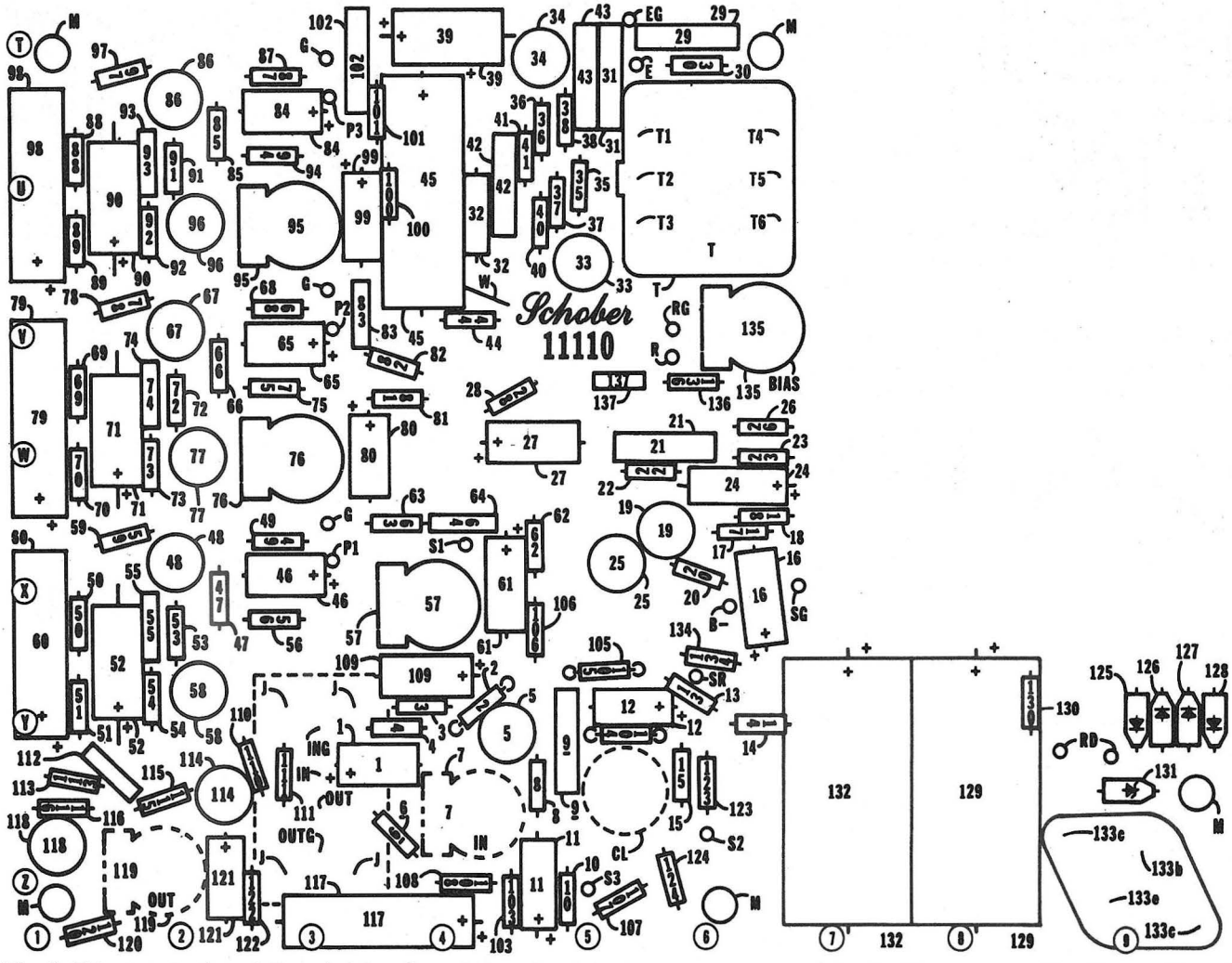


Fig. 2—This reproduction of the painted surface of the printed-circuit board may be used for checking component locations and legends.

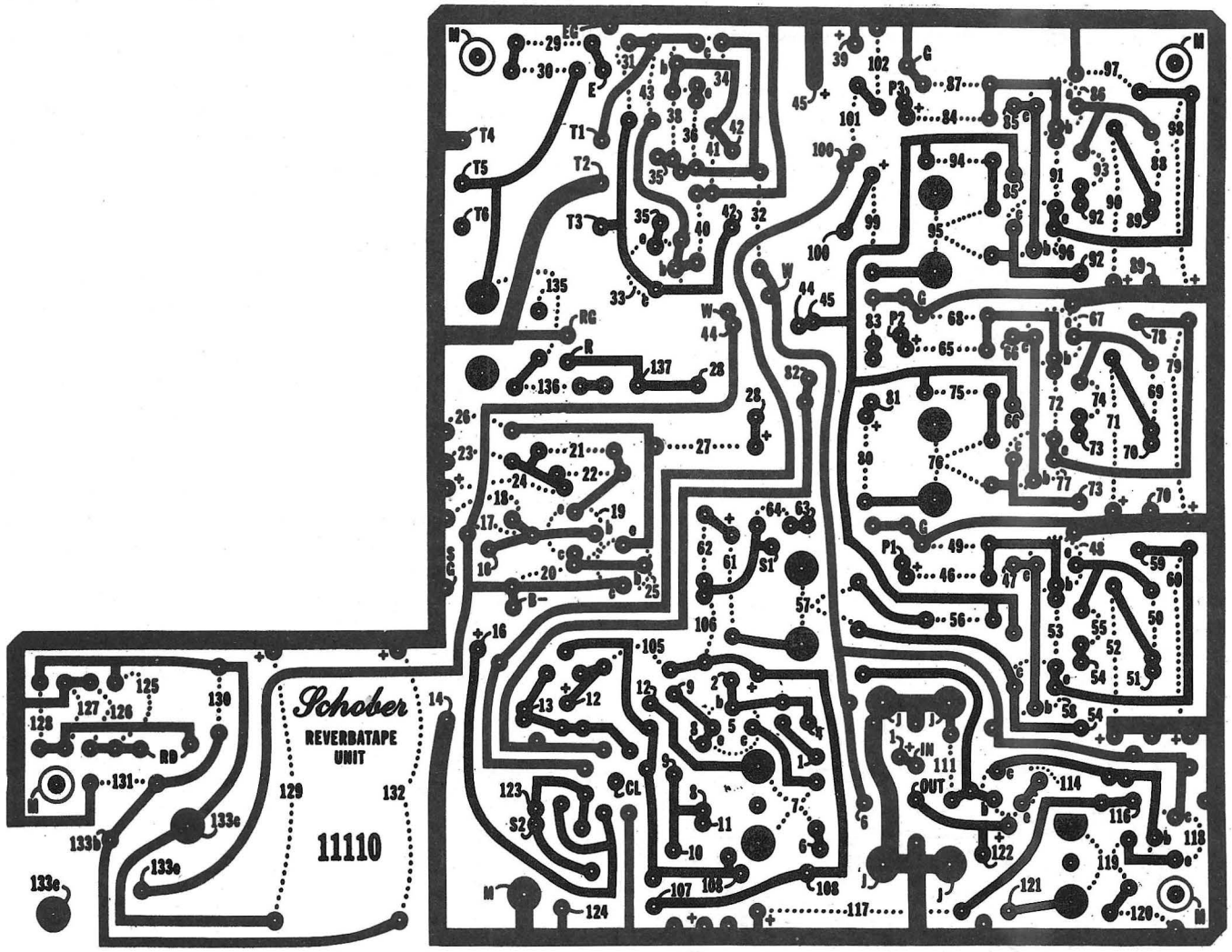


Fig. 3—Copper side of printed circuit. Use this reproduction, after your work is finished, to see that no accidental solder connections have been made between points which are not already connected together by copper lines.

painted side. Each component is located by a painted outline which is approximately (but not necessarily exactly) of the same shape and size as the component. The holes through

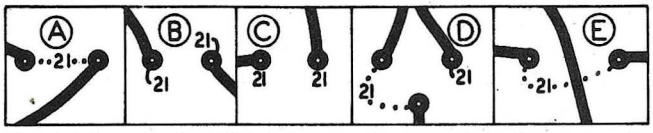


Fig. 4—Five ways in which holes may be marked on the copper side of the printed-circuit board.

which the wires of the component are to go are associated with the outline in an obvious way. Fig. 5 shows three samples. The upper one would be for a mylar capacitor, whose wires emerge from the body somewhere between the

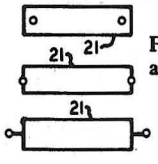
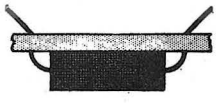


Fig. 5—Three ways in which holes in the board may be associated with a component outline on the painted surface of the printed board.

two ends. The bottom one would be for some component with wires coming out the ends; you would bend the wires over, as shown in Fig. 6, and pass them through the holes. The center drawing of Fig. 5 applies in certain obvious cases. You can almost always check to be certain you have placed the wires through the right holes by looking at the numerals on the copper side.

To mount a component with wires coming from its ends, bend the wires so they are right angles to the body and parallel to each other. Pass the wires through the holes in the board and press the component down against the painted

Fig. 6—Component wires are passed up through holes and spread apart so that the component will not fall away. Wires are usually bent much closer to the ends of the component than as shown in this drawing.



side of the board (the lower face of the board in Fig. 6); it will be right in its painted outline. Bend the wires outward slightly on the copper side of the board, so the component cannot fall out.

Finally, solder the wires to the copper circles surrounding the holes. Fig. 7 shows the soldering operation—iron flat against the wire, tip resting on the copper circle, and solder applied to the wire. When the wire is hot enough the solder will melt. Be sure you keep the iron in place long enough so the solder is thoroughly molten and flows right out to the edges of the copper circle; and apply enough solder for this purpose. Start with a little solder on the iron, as it will transmit heat more quickly to the wire than a bare-clean iron.

Always inspect the solder joint. It should look like A in Fig. 8, not B, meaning the solder has joined smoothly with and blended into the wire. Don't be afraid to use enough solder to encase a joint completely—though slopping on a barrel of it might cause it to flow over the insulating board and make a connection to some other point. (It is quite all right if solder runs along a copper line.) And hold the iron in

Fig. 7—Flat of iron is against wire, point on copper circle. Solder is touched to copper, wire and soldering iron at the same time.

place long enough to make sure the solder is absolutely liquid and both copper and wire as hot as a $3 (inflation-era) pistol. If you use the specified iron, this will cause no harm.

Safety Precautions

There is only one place in the Reverbatape Unit where a dangerous voltage exists. This is behind the metal bracket which holds the top of the motor to the top of the steel box. You have no occasion to get at this area, and indeed to do so

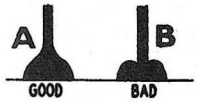


Fig. 8—In a good solder joint, A, the solder tends to climb up the wire and blend smoothly into it. Where you see a small "crater" with the wire coming out of its center as at B, you probably have a bad joint. Reheat wire and solder and add a little new solder. Hundred percent perfect solder joints are vital to Reverbatape functioning and can be assured if you will inspect each joint closely after making it. Any relaxation of this vigilance can cause partial or complete failure of the Unit—not necessarily immediately, but even weeks or months after going into service—with frustratingly difficult diagnosis of the trouble.

without disassembling the bracket would require you to deliberately and with some difficulty poke a finger into the space above the motor.

Because adherence to the instructions and to the simple rule above will give you perfect safety, The Schober Organ Corporation can assume no liability for any damage or injury incurred in connection with your Reverbatape Unit. The power-supply fuse prevents any possibility of fire or damage to your house wiring in case of a short circuit in the Unit. Always use a type 3AG fuse rated at not more than 1 ampere, and never bypass the fuse holder to avoid the necessity of replacing the fuse.

The Reverbatape Unit will operate only on 100 to 120 volts, 50 to 60 cycles a.c. Connection to other voltages or frequencies, or to a d.c. source, may damage it.

ASSEMBLY INSTRUCTIONS

No matter how much you may know about electronics, *follow each of the instructions word for word.* As you complete each numbered step, place a check mark in the square which precedes the step number, so you will not risk skipping a step. Where a step calls for a number of operations, check off each operation.

There is nothing difficult about assembling the Reverbatape Unit. It is, however, a sophisticated piece of equipment, and if you try to put it together while sleepy or while your attention is partially engaged elsewhere, you will pay for it in frustration and trouble-shooting time. The careful worker double checks everything, and is rewarded by a perfectly functioning Unit at the end of assembly.

Resistor Installation

☐ 1. Locate your printed circuit board 11110. You will now begin to install components on it. Unless otherwise noted, all component bodies go on the *painted side* having the component outlines, the wires going through holes and being soldered on the copper side. After soldering the wires of a component, clip off the excess wire.

☐ 2. Separate and put aside one resistor of each of the following values; they will not be used for the present: 10,000, 68,000, 220,000, 470,000, and 68 (the latter is larger than the others). Then bend the wires of all the remaining resistors to right angles with the resistor body, so they can be inserted in circuit board holes, as in Fig. 6. (However, make the bends as close as possible to each end of the resistor.)

☐ 3. Find a 100-ohm resistor and locate outline 35 at coordinates U-5. Put the wires through the holes at the ends of the outline. Pressing the resistor against the board, bend the wires outward (Fig. 6) on the copper side to hold the resistor in place. Put the board on the table, copper side up. Solder the two wires to the copper and clip off excess wire.

☐ 4. In exactly the same way, install all the resistors in the following table, of which you have already completed the first line.

VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
33,100	35	U-5	15,000	23	W-6
33,100	36	U-5	15,000	47	X-2
100	50	X-1	15,000	66	V-2
100	88	U-1	15,000	85	U-2
100	69	W-1	18,000	123	Y-6
1,000	8	Y-5	18,000	15	Y-6
1,000	22	W-6	2,200	56	X-3
1,000	51	Y-1	2,200	75	V-3
1,000	70	W-1	2,200	94	U-3
1,000	89	U-1	2,200	101	T-3
~~10,000~~	26	W-6	2,200	130	Y-8
~~10,000~~	~~37~~	~~U-5~~	22,000	14	Y-6
~~10,000~~	~~38~~	~~U-5~~	22,000	54	Y-2
10,000	28	W-4	22,000	73	W-2
100,000	3	Y-4	22,000	92	U-2
~~100,000~~	17	X-6	27,000	113	Y-1
100,000	110	Y-3	27,000	18	X-6
100,000	122	Z-3	27,000	20	X-6
68,000	91	U-2	270,000	107	Z-5
68,000	72	W-2	330	115	Z-2
68,000	53	X-2	3,300	44	V-4
220	30	T-6	3,300	82	V-4
12,000	62	X-5	3,300	6	Z-4
12,000	81	W-4	33,000	111*	Y-3
12,000	100	U-4	47,000	4*	Y-4
15,000	116	Z-1	33,000	103	Z-4
15,000	124	Z-6	~~3,900~~	136	V-6
15,000	10	Z-5	40,000	40	U-5

*When soldering resistors 4 and 111, try to avoid flowing solder onto the copper area surrounding the large J hole which adjoins one of the connection circles for each of these resistors. If you do get solder on this area, stand the board vertically on its edge with the lettering reading normally and reheat the adjoining resistor wire. The excess solder will flow down and away from the area of copper surrounding the J hole. A thin remaining film of solder will do no harm.

VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
10,000	41	U-5	47,000	49	X-3
390,000	108	Z-4	47,000	68	V-3
470	120	Z-1	47,000	87	T-3
4,700	59	X-2	56,000	13	Y-6
4,700	63	X-4	560,000	106	X-5
4,700	78	V-2	82,000	134	Y-6
4,700	97	T-2			

☒ 5. Install the 33-ohm resistor, the larger one from among those set aside in step 2, in outline 32, location U-4.

Transistor Sockets

☒ 6. There are 13 transistor sockets. Each is a molded piece of plastic with three holes in one end and three bent, pointed metal tabs emerging from the other end. On the painted side of the board find the small circle marked 5 at location Y-4. Insert the three prongs of a socket into the three holes inside the circle, guiding them as necessary with a fingernail. Note that the socket is on the *painted side* of the board. Press the socket against the board gently until the prongs snap into place. Now turn the board over and solder each prong to the circle surrounding the hole. Check carefully to see that you have not accidentally soldered two prongs together.

☒ 7. In the same way install the remaining 12 transistor sockets in the circles marked with the following numbers: 19, 25, 48, 58, 67, 77, 86, 96, 114, 118, 33, 34.

Tubular Terminals

☐ 8. Find the tubular terminals. They are small metallic tubular pieces about ½ inch long and 1/16 inch in diameter, with a point at one end, the other end open. Turn the printed circuit so the *copper* side is up, and hold it in your hand. Put the pointed end of a terminal into hole P1 (location X-3). Use a flat object to press the terminal *straight down* into the board as far as it will go—until you can see that its shoulder is right down against the copper. Now solder the terminal to the copper. Use plenty of solder, not only to secure the terminal to the copper, but also to fill up the terminal. If looking at the open end of the terminal, which is on the copper side of the board, does not show you that it is full of solder, deliberately heat the terminal's side with the iron and melt solder into its open end.

☒ 9. In the same way, install terminals in the following holes. Remember that the open end of each terminal must be on the *copper* side of the board, the point showing through on the painted side. Fill up each terminal with solder. Note that hole G is mentioned three times because there are three holes labeled G.

HOLE	LOCATION	HOLE	LOCATION	HOLE	LOCATION
P1	X-3	G	V-3	R	V-6
G	X-3	P3	T-3	RG	V-6
P2	V-3	G	T-3	E	T-5
		EG	T-5		

☒ 10. In the same way, install the following terminals, but this time the open end of each terminal must be on the *painted* side of the board, with the point emerging on the copper side. Solder the pointed end to the copper side. Then turn the board over and fill the open end of the terminal, if necessary, with solder. Note that the numbers 104, 105, and 2, and the designation RD appear twice each, meaning that two holes and terminals are involved in each case.

HOLE	LOCATION	HOLE	LOCATION	HOLE	LOCATION
RD	Y-9	105	Y-5	SR	Y-6
RD	Y-9	2	Y-4	S1	X-4
104	Y-5	2	Y-4	S2	Z-6
104	Y-5	B	X-6	S3	Z-5
105	Y-5	SG	X-6		

☒ 11. Recheck to see that you have 10 terminals with their open ends on the copper side of the board, and 14 with open ends on the painted side—and that all terminals are filled with solder.

Capacitor Installation

☐ 12. Select a 5-mfd, 50-volt electrolytic capacitor and bend the wires just as you did with resistors. Note that one end of the capacitor is marked POSITIVE or +. Install the capacitor at outline 1, location Y-3, turning it before inserting the wires so that the POSITIVE or + end wire goes into the hole marked with a + sign on the board. Bend the wires on the copper side, just as you did with the resistors, to hold the capacitor in place. Then solder both wires and clip off the excess.

☒ 13. Install 5-mfd, 50-volt capacitors in the same way per the following list. *Observe the + signs!* 1 (Y-3); 12 (Y-5); 16 (X-6); 27 (W-5); 46 (X-3); 61 (X-4); 65 (V-3); 80 (W-3); 84 (T-3); 99 (U-3); 109 (Y-4); 121 (Z-2). Check to see that you have installed 11 5-mfd capacitors.

☒ 14. Observing the + signs, install four 225-mfd, 10-volt electrolytic capacitors as follows: 60 (X-1); 79 (W-1); 98 (U-1); 117 (Z-3). Recheck for + signs.

NOTE: Capacitors 60, 79, and 98 are arranged on the board end to end. See that the wires of 60 and 79 and of 79 and 98 are not touching each other. If they are, just bend the wires as necessary to prevent touching.

☒ 15. Observing the + signs, install three 250-mfd, *3-volt* capacitors as follows: 52 (Y-1); 71 (W-1); 90 (U-1). Check for the + signs.

☒ 16. Observing the + signs, install two 25-mfd, 10-volt electrolytic capacitors at positions 11 (Z-5) and 24 (W-6).

☒ 17. Observing the + sign, install a 250-mfd, *25-volt* capacitor in position 45 (U-4).

☒ 18. Observing the + signs, install the two 500-mfd, 50-volt capacitors at 129 (Y-8) and 132 (Y-7).

☒ 19. Observing the + sign, install a 50-mfd, 25-volt capacitor at position 39 (T-4).

☐ 20. Look at the dipped mylar capacitors having decimal values listed in the following table. If any of the material in which they were dipped remains on the wires where they emerge from the capacitor bodies, squeeze the wires at this point with pliers to crack the coating, and then scrape it off, leaving each entire wire clean. Now install the following seven capacitors by passing their wires through the board holes until the body is as close to the painted surface as possible, bending them to hold the capacitor in place, soldering, and clipping off the excess.

VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
.0015	29	T-6	.047	31	T-5
.0047	42	U-5	.068	9	Y-5
.0068	102	T-3	.068	21	W-6
.0047	43	T-5	.01	139	U-5
			.082	27	W-5

☒ 21. The seven disc capacitors are identified simply by the values printed on the discs; disregard any other letters and

numerals that may appear. Find the .001-mfd disc. Push its wires into the holes at position 137 (W-5), the disc on the painted side of the board. It will normally stay in place without any need to bend the wires on the copper side. Solder them to the copper and clip off excess.

☐ 22. Install the following discs in the same way:

VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
.001	137	W-5	.003	74	W-2
.002	112	Y-1	.003	93	U-2
.003	55	X-2	.005	83	V-3
.003	64	W-4	.47	37	V-5
1000pf	140	Z-1	.47	39	U-4
47 pf	142	X-6			

Resistors On Terminals

☒ 23. Of the remaining resistors, bend the wires of all three *other than the 10,000-ohm resistor* just as though you were going to insert them in the board in the usual way. Then clip off both wires of each resistor so that only ½ inch of wire remains below the resistor body. Hold the 220,000-ohm resistor over outline 105 (Y-5), and let the tips of the wires rest right on top of the solder which is inside the open ends of the tubular terminals which have been installed in the two holes at the ends of outline 105. (Bend the wires, if necessary, so they are spaced apart exactly to fit the terminal separation.) Heat the side of one terminal until the solder melts and allow that resistor wire to sink into the molten solder within the terminal for about 1/16 inch or a little more. Then remove the iron and let the solder harden without moving the resistor. In the same way, heat the other terminal and let the other resistor wire sink into the molten solder. (If necessary, push aside capacitor 12 [5 mfd] to avoid burning it.) Let the solder harden.

NOTE: This is the standard method of connecting wires to tubular terminals. (a) Hold the wire tip on the solder inside the terminal. (b) Heat the side of the terminal and let the wire sink into the solder (usually all the way, right up to the insulation for ordinary wires). (c) Remove the iron and let the solder harden without moving the wire.

☒ 24. In the same way as step 23, install the 68,000-ohm resistor in the terminals at outline 104 (Y-5); and the 470,000-ohm resistor at 2 (Y-4).

Diode Installation

☒ 25. Find the five diodes—black bullet-shaped units about 3/8 inch long and about 3/16 inch in diameter. Only one of them (the zener diode) is marked IR30B or 04IR30B. Bend the wires of this unit as for a resistor and take it to outline 131 (Y-9). Turn it so that the small end of the zener diode corresponds with the small end of outline 131. Then pass the wires through the holes and install the diode in the usual way with its body on the painted side of the board.

NOTE: If the zener diode is not bullet shaped it will be packed in a separate envelope marked 04IR30B for recognition. If the diode symbol which appears within outline 131 appears on the diode, turn it so the symbols agree. If not, the end having a dot or one or more bands should be at the small end of the bullet-shaped outline.

☒ 26. The remaining four diodes are marked D200 or 04D-200. Install them in outlines 125, 126, 127, and 128 (Y-9), with the small end at the small end of the outline.

NOTE: As with the zener diode, if these four are not bullet shaped, they will be packed separately in an envelope marked 04D200. Match the diode symbol with that in the outline, or place the end having a dot or one or more rings at the small end of the outline.

Miniature Potentiometers

The miniature potentiometers have two small bent-over, pointed prongs and a serrated wheel. The three packed with the other items in your kit have blue wheels, and you may rotate these wheels experimentally to see how they work. Three potentiometers with *white* wheels are packed in an envelope taped to the inside of the steel box containing the tape mechanism. These three have stickers with the numbers 57, 76, and 95 on them. *The settings of the white wheels must not be altered.* The white-wheeled units have been calibrated at the factory for the particulat magnetic heads on your mechanism. Handle these potentiometers with great care during installation. *Their settings must not be changed.*

Each blue potentiometer must be identified by looking at the metal ring on its underside, where two numbers are usually stamped in the metal. Two are marked 014253A and the other 014402A.

☒ 27. Find the blue potentiometer marked 014402A. Find dashed outline 119 at Z-2 on the board. Then turn the board over to see the four holes, two large and two small, from which dots lead to the number 119 which appears in copper. Place the terminals of the potentiometer in these four holes, with the body of the potentiometer on the *copper* side of the board. The two small pointed prongs will go into the small holes and the large tabs into the large holes. Press the potentiometer against the copper surface of the board until it snaps in place; it will not fall out. Solder each of the four terminals to the copper circle surrounding it. When soldering the large tabs, it is not necessary to fill the holes with solder since a part of each hole is under the potentiometer. Just be sure the curved surface of each tab is securely soldered to the visible part of each connection circle.

☒ 28. Find the four holes marked 7 (Z-4) on the *copper* side of the board. Notice that a hole marked 6 is very close to one of the small ones. See that the wire which was soldered at this hole was clipped off as short as possible and that the solder mound is not excessively large. Now mount one of the blue potentiometers marked 014253A in the holes marked 7, in exactly the same procedure as you used in step 27. Make sure the body of the potentiometer is on the *copper* side of the board.

☒ 29. All the remaining potentiometers will be mounted on the *painted* side of the board, along with all the resistors and capacitors. Place the remaining blue potentiometer marked 014253A over outline 135 (V-6) and press its terminals into the four holes. Turn the board over and solder all four terminals to their copper circles. This time you can fill the holes with solder and connect to the entire area of each copper circle.

☒ 30. Being very careful not to turn the wheels, install the three white potentiometers at the outlines corresponding to their numbers—57 (X-4), 76 (W-3), and 95 (U-3). These are all on the *painted* side of the board.

☒ 31. Recheck to see (a) that controls 7 and 119 are on the copper side of the board and the other four on the painted side; (b) that the numbers on all three white units correspond with the numbers painted on the board; and (c) that all four terminals of every potentiometer are well soldered.

Transistors, Connectors, Oscillator Transformer

☐ 32. Find and make available the 2N2148 power transistor (looks like a hat with a diamond-shaped brim and is marked 2N2148), two ½-inch-long machine screws, two hex nuts, two small lockwashers, and two ¼-inch-long tubular spacers. With the board on the table, painted side up, place a spacer over each of the two holes marked 133c (Z-9). Carefully put the transistor on top of the two spacers, turning it so that its two end holes will go right over the spacers and simultaneously its two pins will go down through the holes marked 133b and 133e. Drop a screw down through each transistor hole, through the spacer, and through the 133c hole in the board. Holding these screws in place with two fingers, pick the board up and turn it over. On the copper side, where the screws come through, drop a lockwasher over each screw, followed by a nut. Tighten both screws firmly (but don't show off your muscles and crack the board). Then solder the two transistor pins to the copper surrounding the 133B and 133e holes. *Do not clip off the excess lengths of pin.*

☒ 33. Find the control socket. This is a 7-pin *socket,* which has holes in the top and flat terminals at the bottom, *not* the 7-pin plug, which has straight wire prongs. Make ready also the 17/32-inch-long tubular spacer, the ⅞-inch-long self-tapping screw with the hex head, and a small lockwasher. Hold the socket in one hand and push the end of the screw firmly into the socket's center hole at the *bottom* of the socket—the surface from which the 7 flat terminals emerge. Pushing the screw in, rotate it so that the threads catch in the hole. Now use a ¼-inch nutdriver to drive the screw in until its end just emerges from the top of the socket. The purpose of this is to cause the screw to cut threads in the socket hole. Finally, remove the screw entirely by turning it counterclockwise. Clean off the screw threads and blow out any plastic chips lodged in the socket hole.

☒ 34. Find the dashed circle CL (Y-5) on the printed board. Pass the self-tapping screw through the hole in the center of this circle, with the screwhead on the *painted* side of the board. Where the screw emerges on the copper side, place the spacer over it. Follow this with the lockwasher. Now attach the socket to the end of the screw, turning the screw into the threads you made in step 33. Note that the flat terminals of the socket are *toward* the copper face of the board. While you are still able to rotate the socket, turn it so that the end of one flat terminal is directly over each of the 7 small holes which surround the screwhole. Note that there is a large gap between two of these holes and a corresponding one between two of the terminals. Match these. Now tighten the screw fully without letting the socket turn. Notice again that the tubular spacer and 7-pin socket are on the *copper* side of the board.

☒ 35. Straighten your bare wire. Pass an end through the hole at the end of one of the 7 flat socket terminals, then on down through the board hole just beneath the terminal. Solder wire to terminal; then solder it to the copper surrounding the board hole. Clip off the wire above the terminal and any which shows on the painted surface of the board. In the same way, connect each socket terminal to the hole just beneath it.

☒ 36. Find the double phono jack. This is a brown piece of insulating board 1 × 1½ inches, with two small, round metal jacks mounted on it. Gather also four ⅝-inch tubular spacers, four 1-inch screws, four small lockwashers, and four hex nuts. At location Y-3 on the painted side of the board, find the dashed rectangular outline with four J holes (among others) in it.

☒ 37. Turn the board over, copper side up. Hold the phono jack over it so that the four corner holes correspond to the four J holes. Notice that you are holding the jack assembly over the *copper* side of the board, and that the terminals of the jacks themselves point toward the board. Drop a screw through a corner hole in the jack assembly, its end toward the board. Place a tubular spacer over the corresponding J hole on the board. Pass the screw down through the spacer and through the J hole. On the painted side, add a lockwasher and nut; *do not tighten the nut.* In the same way, use screws, spacers, lockwashers, and nuts through the remaining three jack corner holes and board J holes. Finally, tighten all the screws firmly. The jack assembly is now on the copper side of the board, spaced ⅝ inch from it.

☒ 38. On the printed board there is a hole just beneath each of the four jack terminals. Pass bare wire up through each hole and use long-nose pliers to secure each wire to its terminal. Then solder each wire to the terminal and to the copper. Clip off excess wire on the painted side of the board.

☒ 39. The oscillator transformer is a large black piece with 6 terminals coming out of the bottom. On the painted side of the board at location U-6 see the large rectangular outline labeled T. On one side of the outline there is a jog or notch right near the hole marked T2. There is a tab emerging from one side of the transformer body. On the painted side of the board place the transformer over the outline so that its tab matches the notch in the outline and the 6 terminals go into the holes within the outline. Holding the transformer tight against the board, turn the board over and solder the terminals to the copper around holes T1 through T6.

☐ 40. Cut a 2-inch piece of bare wire and use long-nose pliers to bend it into a ⌊⌋ shape, with the bottom ⅜ inch and each side at least ½ inch. Insert the ends into the two holes marked W, with the body of the wire on the painted side of the board and the two ends protruding through the holes on the copper side. Bend the wires over a little on the copper side to hold this jumper wire in place; then solder both wires and clip off the excess.

☒ 41. Make ready the following hardware: five 13/16-inch tubular spacers with threaded center holes, five ¼-inch screws, and five small lockwashers. Find a hole marked M at T-1 on the board. Pass a screw through it with the head on the *painted* side. On the copper side, place a lockwasher over the screw. Then wind on a threaded spacer. Finger-tighten. Then tighten thoroughly with a screwdriver, but do not use strength enough to crack the board. Merely make sure it is impossible to rotate the spacer with your fingers. Attach the remaining spacers in the same way to four more M holes at T-6, Z-1, Z-6, and Y-9.

☒ 42. Check your printed circuit to see that there are no empty holes by holding it against the light. Examine all solder joints. Be sure no excess solder has bridged two points not already connected by a copper line. For this purpose, compare your board with Fig. 3, which shows all the copper lines; there is no objection if solder covers all or part of a copper line. Compare it, too, with Figs. 11 and 12, though you have not yet added the cables shown in Fig. 11 or the transistors which appear in Fig. 12.

Head Cables

☐ 43. Fold your length of insulated thin green wire in thirds and cut three equal pieces. Take two of the wires and, beginning about an inch from one end, twist the two pieces tightly together to form a twisted two-wire cable. At the untwisted end remove about ¼ inch of insulation from each wire. You can do this with a thumbnail to avoid nicking the wire. Then cut the other end of the cable off so that the remaining length is 12 inches.

☐ 44. With the printed board on the table, copper side up, heat tubular terminal E (T-6) and sink the bared end of one wire into the solder inside it, as you did the resistor wires in steps 23 and 24. Connect the other wire in the same way to terminal EG (T-6).

☐ 45. Twist together your thin brown wire and the remaining piece of green wire, and cut the ends so that a 10-inch cable remains. Bare both wires at one end of the cable. Solder the green wire into terminal R (V-6) and the brown one into terminal RG (V-6), both on the copper side.

☐ 46. At the free ends of both cables separate the wires for about an inch and remove about ⅛ inch of insulation from each of the four wires.

☐ 47. Locate the magnetic head clips. They are small, metal, channel-like units about 5/16 inch long. At one end

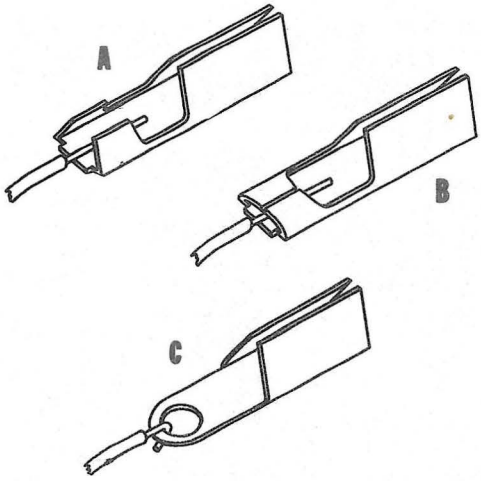


Fig. 9—The magnetic head clips furnished may be of the type shown in A and B or like that in C. B shows clip A after its tabs have been crimped down on the wire to hold it in place before soldering.

there may be a flat piece with a hole in it, as in Fig. 9C, or there may simply be two small tabs as in Fig. 9A. The end having the hole or the small tabs is the end to which you will connect a wire. The other end is folded over to form a tube, and that end will be slipped over one of the connection prongs of a magnetic tape head.

☐ 48. Soldering to these clips is the most delicate operation of your Reverbatape Unit construction. This is because you must make a good solder connection to the wire without allowing any solder to get into the tubular part of the clip which must later fit over a head prong. Follow the instructions in detail with the greatest care. If at any time you get solder into the tubular end of a clip, unsolder the wire and throw away the clip. Extras are furnished; only 10 are actually needed. Also try to avoid burning wire insulation, though it is almost impossible not to burn at least a little.

☐ 49. If your clips have the hole in the end, bend a small hook in a bared end of one wire, using the smallest long-nose pliers you have. Hook the wire into the hole and clinch the wire lightly, thus making a mechanical connection to the clip. If your clips are like that of Fig. 9A, place the straight wire end between the tabs and crimp the tabs down on the wire—lightly, so they do not bite into the wire but merely keep it from falling out.

☐ 50. Prop up your Ungar soldering iron on the table so that the flat at the tip is almost parallel to the table. Holding the tubular end of the clip *lightly* with pliers (you must not squeeze the cylinder or it will not later fit over the head prongs), place the wire connection atop the iron, holding it so the tubular end of the clip is somewhat higher than the wire end to prevent solder from flowing into the tube by force of gravity.

☐ 51. Apply just the smallest amount of solder to the connection that will definitely join wire and clip. Then remove the work slightly from the iron and hold it motionless until the solder hardens, remembering to keep the wire end lower than the other end. Examine the connection carefully to be sure it is good.

☐ 52. Solder clips to the remaining three wires the same way.

☐ 53. Cut three 12-inch lengths of your single-conductor, shielded, insulated cable.

☐ 54. At one end of one cable remove about ½ inch of the thin outer plastic cover. The best way is to slit the plastic for the required distance with a *very light touch* of a *sharp* razor blade, being very careful not to press hard enough to nick the shielding just under this jacket. Split the plastic at the cut, peel it away, and cut it off. Now unwind the spiral shielding from around the inner insulated wire, and twist the thin strands of shielding together tightly to form a "shield wire." Finally, remove about ¼ inch of the insulation from the inner wire and twist the exposed strands tight together. Clip off a part of the shield wire so that only enough remains to reach the end of the inner wire. The result appears in Fig. 10.

☐ 55. Follow step 54 for each of the remaining two cables.

☐ 56. At the untreated end of each of the three cables, follow step 54; but instead of removing ¼ inch of insulation from the end of the inner wire, remove only ⅛ inch.

☐ 57. Solder a magnetic head clip to the end of each cable which you bared only ⅛ inch in step 56, and solder another

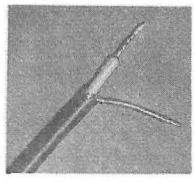


Fig. 10—This is how a shielded wire looks after its end has been prepared per the instructions.

clip to the very end of each shield wire. This is 2 clips per cable, 6 in all. Follow the procedure in steps 49 through 51.

☐ 58. Apply a very light coating of solder to the free ends of all three cables, and also to all three unused shield wires after making sure the strands of each wire are tightly twisted together.

☐ 59. With the copper side of your board up, solder the inner wire of one cable into tubular terminal P3 (T-3) and the shield wire into the nearest G hole, about ½ inch away.

☐ 60. Solder the inner wire of a second cable into terminal P2 and the shield wire into the nearest G terminal.

☐ **61.** Solder the inner wire of the third cable into terminal P1 and the shield wire into the nearest G terminal.

☐ **62.** Mark all five of the cables attached to printed circuit terminals with spots of paint, nail polish, or any other permanent liquid coloring material. All spots should be within 4 inches of the connection to the board. Place 1 dot on the thin-wire cable attached to terminals R and RG; 2 dots on the shielded cable attached to P1; 3 dots on the shielded cable from P2; 4 dots on the shielded cable from P3; and 5 on the green pair of wires from terminals E and EG.

☐ **63.** Each of your 13 small transistors has three wires. Clip off each wire so that very slightly less than ¼ inch remains. Carefully straighten each wire; they are now the prongs or pins which will be inserted into the sockets. Find the transistors marked 2N2102 or 042102. Plug them into sockets 33 and 34. Do this carefully, locating each "pin" first in its hole and then pressing gently but firmly *straight down.* A light upward pull will now confirm that the socket terminals are grasping the three wires.

☐ **64.** The remaining small transistors are marked 046127 and have a red paint mark on them. Plug them into the remaining sockets. Then check again to see that the 2N2102's are in sockets 33 and 34.

NOTE: If you should ever require a replacement 046127 transistor, always specify "o46127 *red-marked*" for the Reverbatape Unit. These are specially selected low-noise transistors. Temporarily in an emergency, however, any Schober 046127 transistors may be used. Do not, however, use anything but 2N2102 or 042102 transistors at 33 and 34.

Printed Circuit Installation

☐ **65.** Looking into the rear of the steel box which has the tape mechanism on its front face, notice the vertical steel motor shield to which the power transformer is attached. *Do not remove the transformer from the shield.*

☐ **66.** Remove the three hex-head self-tapping screws which hold the motor shield to the box. (Note that this piece is not the piece just above the motor; it is to the left of the motor as you look in the back of the box.) Two of the screws go through the top of the box and one through the bottom. Slide the shield right out the back of the box and lay it on the table as in Fig. 13. Keep good track of the screws.

☐ **67.** Place the printed circuit in the box just as you see it in Fig. 13, pushed all the way in. Remove the Plexiglas cover from the front of the box by taking off the three knurled nuts. Notice that there is an empty 3/16-inch hole just beneath each of the five magnetic heads.

☐ **68.** The *record head* is the one nearest the large brass in-

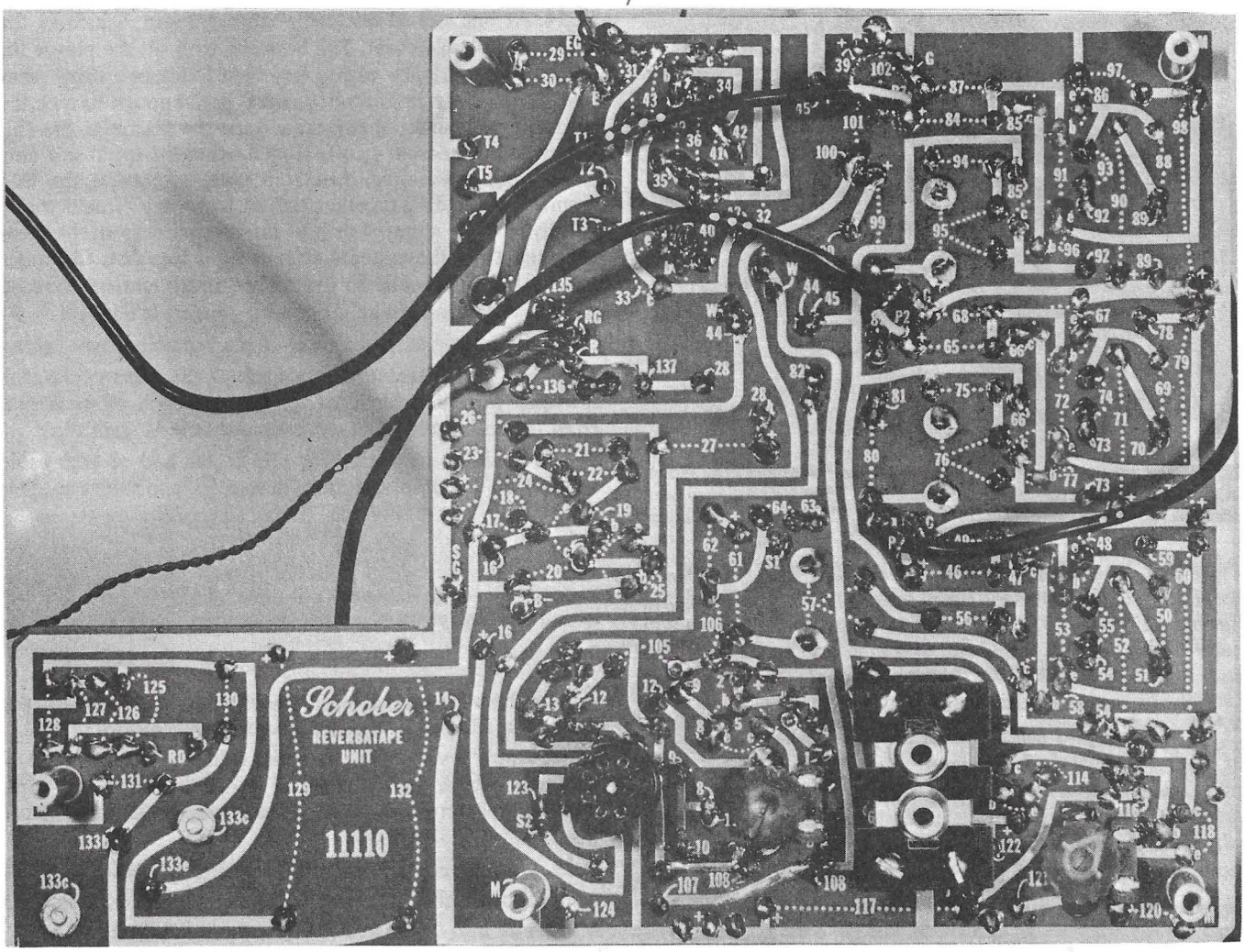


Fig. 11—The copper surface of the printed-circuit board after completion. Notice the five magnetic head cables and their origins, and the dots painted on each one. Disregard the settings of the two potentiometers in this photograph.

ertia wheel. Pass the clip end of the cable with 1 dot (brown and green wires) through the hole under the record head.

69. Pass the 2-dot cable (shielded, from P1) through the hole under the next head, which is *playback head 1.* Pass the 3-dot cable through the hole under the third head, which is *playback head 2.* Pass the 4-dot cable through the hole under the fourth head, which is *playback head 3.* Finally, pass the 5-dot cable (green pair) through the hole almost under the fifth head, which is the *erase head,* passing this cable *above* the 4-dot cable before pushing it through its hole.

70. Leaving the printed circuit in the bottom of the box, turn the entire assembly around so the front is facing you. You will now attach the clips to the head prongs.

71. Begin with the record head, nearest the brass wheel. At the end of the *green* wire, grasp the flat part of the clip, to which the wire is attached, with long-nose pliers. Press the tubular part of the clip upward onto the head prong nearest the surface of the box. A little force should be necessary, so support the top of the record head lightly with your other hand so you will not tend to bend the head's mounting bracket and change the head's position even slightly. Push the clip far enough onto the prong so it will obviously stay there, but do not use any real force to try to make it go all the way on. Now attach the clip of the brown wire to the remaining record head prong.

72. In the same way, attach the clips of each remaining cable to the prongs of the head above it. For the shielded cables, attach the clip of the inner wire to the prong nearest the box surface. At the erase head, it does not matter which of the green wires connects to which prong.

73. Examine each head closely to see that the clips and any bared wire back of them cannot touch anything but the head prongs. Then push all unneeded wire lengths back through the holes into the box.

74. Turn the whole assembly again so the back faces you. Look at Fig. 13. Notice that the thin green wires leading to the hole under the erase (last) head are pressed against the inner face of the box, right between the 4-dot cable and two hex nuts just above the No. 4 hole. Place these wires as shown and hold them there with a piece of sticky tape (masking or similar, not electrical tape, which is not sticky enough) placed as in Fig. 13. This 5-dot thin-wire cable must pass under a notch in the motor shield, and if it is not correctly located the shield will pinch it against the box front and damage it.

75. Turn the assembly so a side of the box faces you. If you are right-handed, the back of the box should be at your left—and *vice versa.* Locate the five ½-inch machine screws from your kit.

76. Push all five cables as close to the copper surface of the

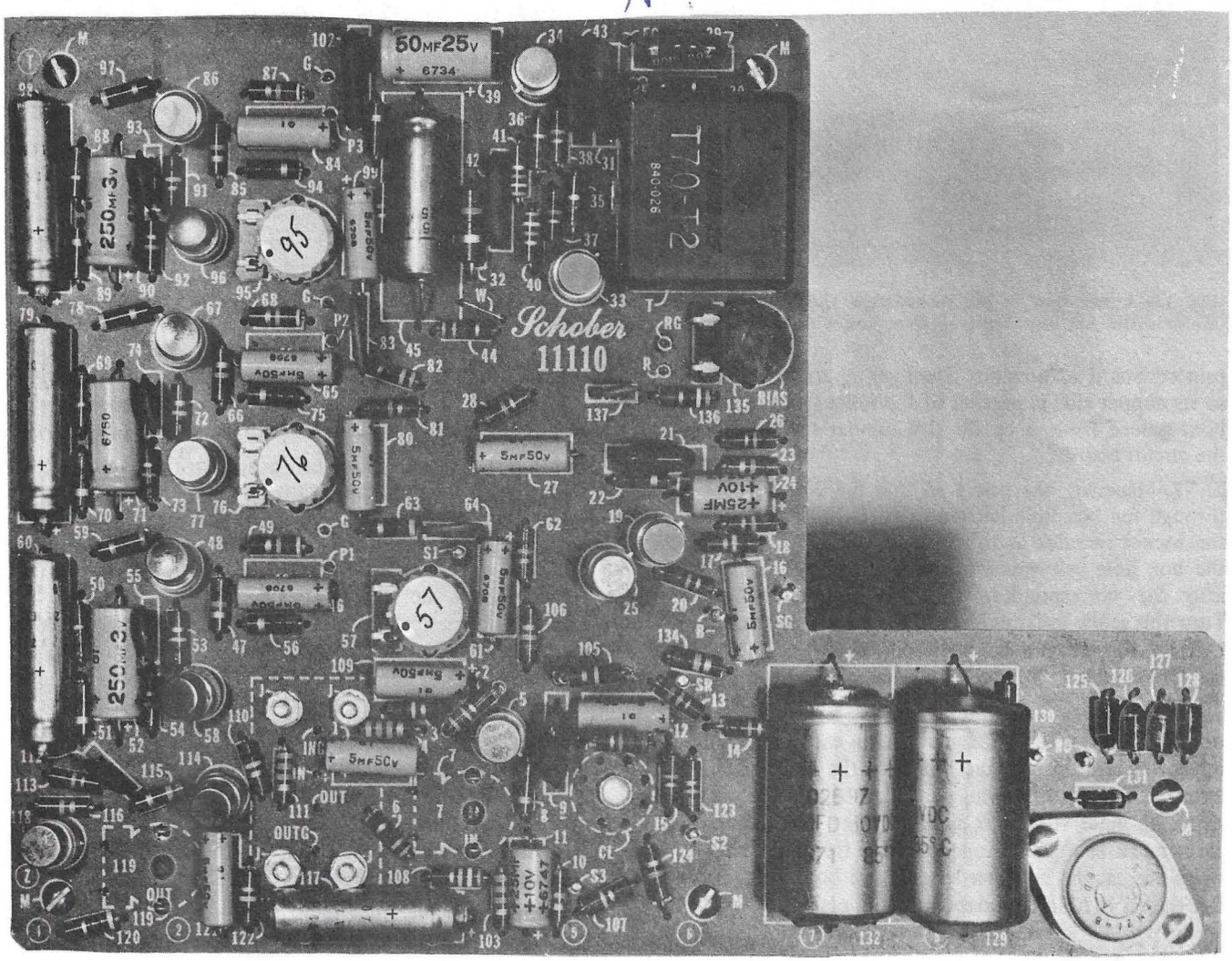


Fig. 12—This photograph shows how the painted side of your board should look after completion. Disregard the potentiometer settings here.

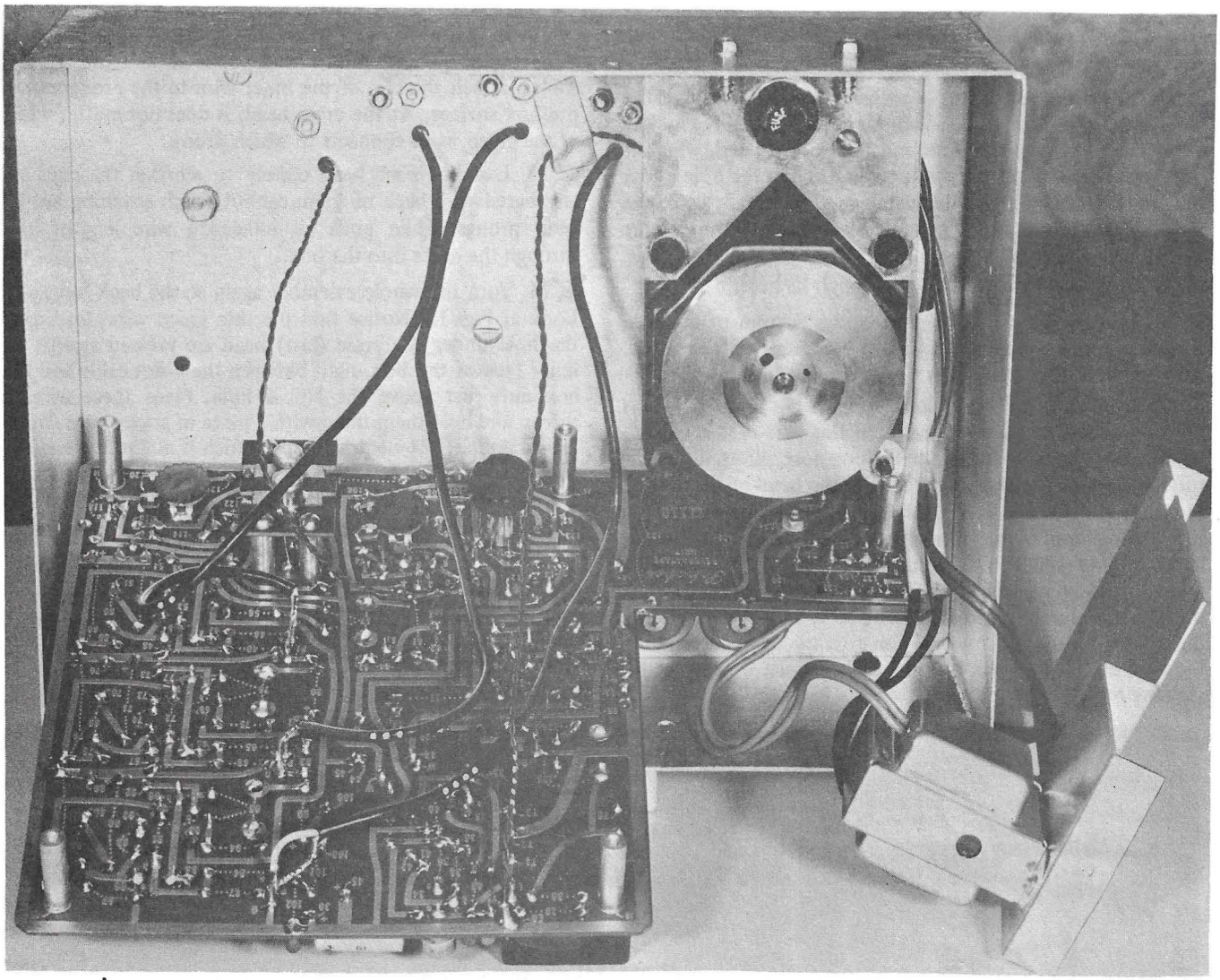


Fig. 13—A rear view of the Reverbatape Unit with the five magnetic head cables passed through holes in the front mechanism panel. Motor shield has been removed from box without disconnecting transformer wires. Note positioning and taping of the erase head cable.

printed board as possible. Then gently straighten the board so its copper side is parallel to the inner front surface of the box, spaced from it by the five tubular spacers attached to the circuit board.

77. Maneuver the board so that the 7-prong socket goes through the box hole labeled CONTROL; hold the board so the socket remains in this hole. Then pass a screw through the box hole below and to the left of the CONTROL hole, into the corresponding threaded spacer on the board. Turn this screw in far enough so the socket will remain in the CONTROL hole, but leave it loose enough so the board can be rotated a bit to bring the other mounting holes into line.

78. There are four other mounting holes with which the threaded spacers can be aligned. Align each with its hole and insert a screw through the hole into the spacer a few turns. After all the screws are in, push the board inside the box against the inner front box surface to see that the ends of all spacers can be made to touch the box front, meaning that no wires are caught between spacers and box. Then tighten all five screws to hold the board firmly in place.

79. Face the rear of the box. At location Y-9 on the board find the two RD terminals. Solder a red wire from the power transformer into each RD terminal. Push the wire into each terminal right up to the insulation; if the bared ends of the wires are too long to allow this, clip them down to about ¼ inch first. Do not burn insulation on other wires and parts.

80. Fig. 14 shows the final position of the motor shield. Slide it into the box, seeing that the line cord is not tangled in the transformer wires. The upper part of the shield passes between the steel motor bracket attached to the motor and one edge of the printed board. The lower part, on which the transformer is mounted, passes between the two large 500-mfd capacitors. Push the shield all the way in until its mounting holes align with those at top and bottom of the box. *If you encounter resistance, don't force; find the cause and remove it.*

81. Once the shield is all the way in, the shield and box holes may not quite align. In this case, loosen the five screws holding the circuit board to the front panel and move the board slightly toward the non-motor end of the box; then tighten the screws again. Attach the shield with the same hex-head self-tapping screws as held it originally.

82. Replace the front cover on the mechanism and secure it with the original three knurled knuts. Turn the Unit so its Plexiglas face is down. Tuck the slack transformer wires neatly into the corner of the Unit.

You have now finished the Reverbatape Unit proper and it should resemble Fig. 14. If your curiousity coefficient is high you may wonder why terminals S1, S2, S3, B–, SG, and

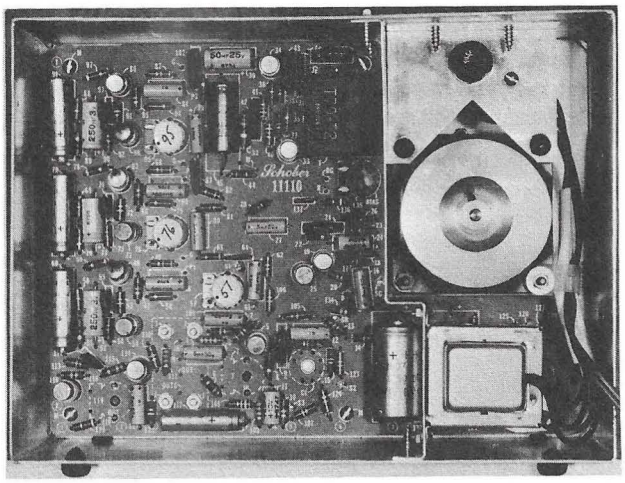


Fig. 14–Rear of Unit after completion. Note how the slack in the transformer wires has been tucked into lower right corner of box.

SR are unused. The answer is that they will be used if you plan to employ the Reverbatape Unit with an organ or audio system having two channels, in which case you may decide to add the Reverbatape Two-Channel Adapter. This adapter is a printed circuit which fits right inside the steel box and it has connections which must be made to these terminals.

Control Assembly

☐ 83. You will now make up the control assembly, for which you will need the 3-gang potentiometer, the 7-pin plug, and its rubber cap, a 10,000-ohm resistor, and the large cable con-

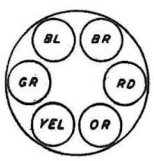


Fig. 15–Find end of cable in which the wire colors are in this sequence. This is the end that connects to the plug. The bare wire is not shown here.

taining 6 individually shielded wires. There is no harm in using the entire 6-foot length of cable even though the Control may not be 6 feet away from the Unit when finally mounted in your organ or audio equipment. However, if you are certain the distance will be shorter, and you wish to avoid unnecessary cable length simply to be extra neat, you can cut the cable down to any length you like. Cutting it short will not improve operational results in any way.

☐ 84. Find the end of the cable at which the wire colors are positioned as in Fig. 15. (Notice that the colors run clockwise from brown through blue, meaning numbers 1 through 6 according to the resistor color code.) At this end of the cable remove not more than ⅜ inch of the outer brown jacket. Be careful not to cut into any shielding or insulation of the wires inside the jacket.

NOTE: After you have removed the outer jacket you will see that there is an additional bare wire in the cable, which may be either stranded or solid. Be sure to distinguish it from the wire shields. Cut away any exposed twine filler and transparent wrap.

☐ 85. Grasp the ends of the wires and pull the jacket back forcibly so as to expose more of the shielded wires without cutting more of the jacket away. Separate each wire from the rest and unwind its spirally wrapped shield wire. Cut away all shield wire as close to the end of the jacket as possible–*but be sure to avoid cutting the bare wire mentioned in the note above.* The idea is to get rid of all strands of shield wire, so as to leave the bare wire as the only remaining electrical connection to the shields.

☐ 86. Carefully remove exactly ¼ inch of insulation from the end of each wire. Twist the exposed strands tightly together and coat them with a thin film of solder, thus forming the strands into a single solid wire in each case.

NOTE: When soldering wires to the plug terminals, remember that the numbering is *counterclockwise,* as shown in Fig. 16, which is a view of the terminal loops. This warning is meant especially for those familiar with electronics, as the plug terminals are reminiscent of the base of a tube socket. This unit is, however, a *plug,* equivalent to a tube base, and it is therefore a mirror image of the terminals of a tube socket, with *counterclockwise* numbering.

☐ 87. Bend a hook in the end of the brown wire. Hook the wire to terminal loop 1 on the socket and clinch it. See that the wire insulation comes right down to the terminal, and cut off any unnecessary wire at the end of the hook. Solder. The point of these precautions is to prevent any possibility of

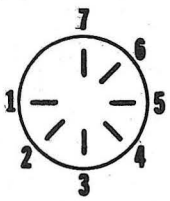


Fig. 16–The 7-prong plug, viewing face on which terminals appear. Note counterclockwise numbering, contrary to that on a 7-pin tube socket.

two wires touching after the unit is assembled and the cable able to move. Now solder the remaining wires in the same way, according to the color code: red to 2, orange to 3, yellow to 4, green to 5, and blue to 6. Take great care. Finally, solder the bare wire to pin 7. Arrange the bare wire between the jacket and the terminal in such a position that it is away from the other wires. Then add a little solder to stiffen it and prevent it from moving. Do not apply enough heat to melt insulation of any wire with which it may be in contact.

☐ 88. Carefully examine all connections and flex the wire a bit to see that nothing can touch anything else. Then grasp the cable about a foot from the plug with thumb and forefingers of both hands. With one hand remaining in position, slide the other one toward the plug, exerting pressure as you go. This will push the jacket as close to the plug terminals as possible. Slide the rubber cap over the free end of the cable, large end first. Force it over the body of the plug.

☐ 89. Remove 1⅜ inch of the outer jacket from the other end of the cable. Make sure all 6 shielded cables and the bare wire are 1⅜ inches long. Hold on to the ends of the wires with one hand and with the other pull back the jacket as far as possible. Remove any transparent wrap and twine filler. Unwind the spiral shielding from each wire and clip it off as close to the jacket as possible. Then push the jacket up again so it comes to 1⅜ inch from the wire ends and covers the ends of the shields. Remove ¼ inch of insulation from the end of each wire.

☐ 90. Fig. 17 is a diagram of the terminals of the Control potentiometer. With the end of a pair of long-nose pliers, bend

the ends (the parts having the holes) of terminals A, D, and G up at right angles to the Control shaft. Then pass the bare wire of the cable through G and D (but not A) in that order. Pull the wire through until the end of the outer jacket of the cable is not more than ⅛ inch from terminal G. Then bend a

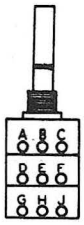


Fig. 17–The 3-gang Control potentiometer. The shaft has an undercut so you can break it off for installations requiring a short shaft. Note the lettering of the terminals.

loop in the wire after it passes through terminal D to hold it in place. Solder the wire to terminal G, *but not to terminal D.* Clip off the excess wire past terminal D.

91. Solder the blue wire to terminal H and the red wire to terminal J. Solder the green wire to terminal E and the orange wire to terminal F. Solder the brown wire to terminal B and the yellow wire to terminal C.

92. Look at Fig. 18, which shows both ends of the Control assembly after completion (with the rubber cap removed from the plug). Notice that on the potentiometer there is a 10,000-ohm resistor connected to terminals A and D. Bend the wires of your resistor to right angles as close to the resistor body as possible. Clip off each wire so that ½ inch remains below the resistor body. Bend hooks in both wires and connect them securely to the holes in terminals A and D. Solder at both terminals, soldering also the wire already connected to terminal D. Your Control should now look like Fig. 18. Do not flex its connections too much, as it is mechanically secured to the cable only by the bare wire, which could break with too much moving about.

Checking, Installation, and Use

Your Reverbatape Unit is now complete and ready to install. You can give the Unit a preliminary test, but before doing so be sure to follow the instructions packed with the mechanism itself about mounting the tension arm, etc.

Plug the line cord into a 117-volt, 50-60-cps outlet. The tape should move. If you have a d.c. voltmeter you may care to check the power supply. With the *positive meter lead* clipped to the steel box and the *negative lead* touched to the right wire of resistor 44 (see location diagram pasted inside box) you should read about 30 volts.

Your Installation Kit contains installation instructions for the organ or equipment you have specified. These instructions also tell you how to adjust the blue potentiometers on the printed circuit. The Reverbatape Unit cannot work correctly until you have made these adjustments properly; so be sure to read and follow the Installation Instructions thoroughly before expecting to get good results. *Do not touch the three white potentiometers.*

A Reverbatape Service Manual is also included in your kit; consult it if you have any problems–and write to Schober if you still cannot solve a problem. A "how it works" article is also included in the kit. If this article is marked 24RVRP at the bottom of each page, the diagram and photos do not correspond precisely in a few details with this latest model RV-3A unit. However, this will not deter you from technical understanding of the Unit if you have a technical background. It is not necessary to understand the Unit technically, and this material is included only as a matter of interest.

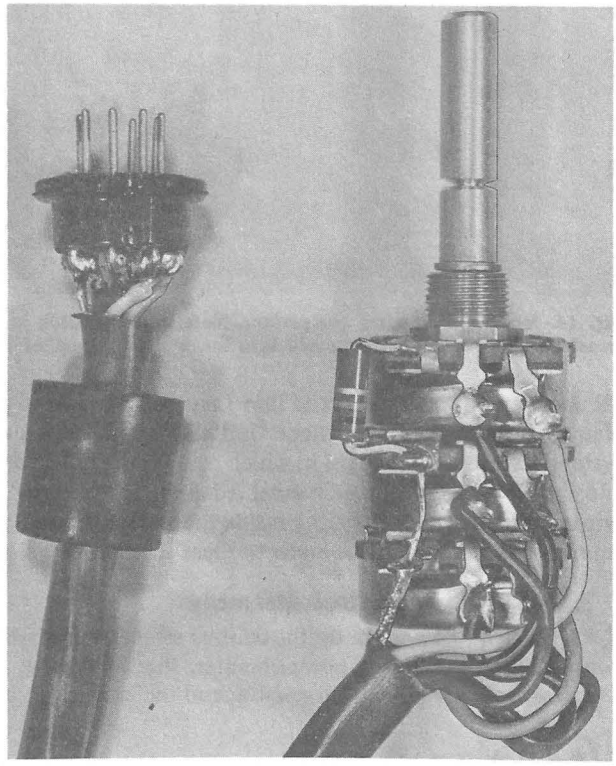


Fig. 18–Both ends of the finished Control assembly. Notice how the 10,000-ohm resistor is installed at terminals A and D (Fig. 17).

REVERBATAPE UNIT RV-3A

CHANGE NOTICE

Before doing any work on this kit, make the following changes in the attached printed instructions, 24RVA-3A:

A. On page 1, change the parts list to conform with the new quantities as follows:

3 - 100-ohm #011101 instead of 5; 4 - 10,000-ohm #011103 instead of 5; 2 - 100,000-ohm #011104 instead of 7; 4 - 3300-ohm #011332 instead of 3; 2 - 33,000-ohm #011333 instead of 3; 5 - 4700-ohm #011472 instead of 4; 4 - 47,000-ohm #011473 instead of 3; 4 - 68,000-ohm #011683 instead of 1; 2 - 82,000-ohm #011823 instead of 1; 1 - .0068-mfd #0281682 instead of 3; 11 - 5-mfd #0250301 instead of 12.

B. Delete from the parts list the following:

1 - 120-ohm #011121; 1 - 3900-ohm #011392; 2 - 39,000-ohm #011393; 1 - 68-ohm 1 Watt #013680; 11 - Special transistors #046127R; 1 - .0015-mfd mylar capacitor #0281152; 1 - 2N2148 transistor #042148.

C. Add to the parts list the following parts:

5 - Silicon transistors	#045000
6 - Silicon transistors, White marked	#045000W
2 - Finned heat sinks	#09248
2 - 33-ohm resistors	#011330
1 - 220-ohm resistor	#011221
1 - 15-ohm resistor	#011150
1 - 1200-ohm resistor	#011122
1 - 150,000-ohm resistor	#011154
1 - 27-ohm 1 Watt resistor	#010270
2 - .0047-mfd mylar capacitors	#0281472
2 - .01-mfd mylar capacitors	#0281103
2 - .47-mfd ceramic capacitors	#020474
1 - 100-pf ceramic capacitor	#020101
1 - 2N5036 transistor	#045036
1 - Transistor mounting clamp	#09246
1 - .82-mfd mylar capacitor	#0281824
1 - 47-pf ceramic capacitor	#020470

D. On page 5, step 2, change the third line to read as follows: ".....470,000, and 27 (the latter....".

E. Page 5, change the first line of step 3 to read: "3. Find a 33-ohm resistor and.....".

F. Change the following values in the table on page 5, step 4:

NEW VALUE	NO.	LOCATION	NEW VALUE	NO.	LOCATION
33	35	U-5	68,000	72	W-2
33	36	U-5	68,000	53	X-2
3300	26	W-6	220	30	T-6
82,000	17	X-6	47,000	4*	Y-4
150,000	110	Y-3	1200	136	V-6
68,000	91	U-2	10,000	40	U-5

G. Add the following new locations to the table in step 4:

NEW VALUE	NO.	LOCATION
15	138	V-6
4700	141	Y-6

H. Delete the entries in step 4 table for No. 37 and 38 (10,000).

I. Change the first entry in the table at the upper left on page 6 to: "10,000 41 U-5".

J. Change the first line of step 5, page 6 to read: "5. Install the 27-ohm resistor....".

K. Make the following changes in the table of step 20, page 6:

CORRECTIONS			ADDITIONAL LOCATIONS		
NEW VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
.01	29	T-6	.01	139	U-5
.0047	42	U-5	.82	27	W-5
.0047	43	T-5			

L. Make the following additions to the table of step 22, page 7:

VALUE	NO.	LOCATION	VALUE	NO.	LOCATION
100-pf	140	Z-1	.47	37	V-5
47-pf	142	X-6	.47	38	U-4

M. Cross out completely step 32 on page 8, and make a note to refer instead to new step 32 on this change notice.

N. On page 10, cross out completely steps 63 and 64, and make a note to follow instead new steps 63, 64A and 64B instead.

O. On page 5, next to step 4, make a notation to be extra careful when reading the colors of the 270,000-ohm resistor (red-purple-yellow) and the 4700-ohm resistors (yellow-purple-red). It is possible to interchange these values if the colors are accidentally read backwards. Be very sure as you read the colors from left to right that the gold or silver tolerance band is to the right of the other three color bands.

P. On page 12, make a note next to Fig 13 as follows:

"This shows an older unit. The unit supplied has an improved motor, which requires neither a flywheel nor a motor shield. The transformer is now supplied screwed to the bottom of the metal box. Ignore any references to the flywheel or motor shield."

Q. Make a note on the first page of the instructions as follows:

"The printed circuit board number has been changed from 11110 to 11110A. Wherever 11110 is called for, use 11110A instead.

R. In step 20, page 6, change the last word in the 6th line from "seven" to "nine". In step 21, change the first line to read, "The eleven disc capacitors are....".

S. In step 13, page 6, delete location 27 (W-5) from the third line, and change the number 12 in the last line to 11.

T. On page 8, cross out step 40 and make a note to refer to new step 40 on this change notice.

ADDITIONAL STEPS

32. Locate now your power transistor #045036 (or 2N5036), the transistor mounting clamp #09246, two #6 x 1/2-inch machine screws, two lockwashers, and two nuts. Place the transistor pins in holes 133b and 133e, with the body of the transistor nearest the lower right corner (with lettering reading normally) of the printed circuit. Place the clamp atop the transistor so that the flanges of the clamp are away from the board, and the large holes in the ends of the clamp are aligned with the 133c holes in the printed circuit. Drop a screw through each hole. Hold the assembly with one hand, turn the board over, place a lockwasher over each screw, and follow with a nut. Turn both nuts on as tight as possible with your fingers. Then, using a screwdriver, give each screw one-half turn more. Do not over tighten, or you may crack the printed circuit. Solder the pins to the board and clip off excess.

40. Cut two 2-inch pieces of bare wire. Bend one into a U shape, with the bottom of the U approximately 3/8" long. Insert this wire into the holes labeled W (location V-4), press against the board, bend, solder, and clip off the excess. Bend the second wire with the U bottom 1/2" long, and install at W (location X-7) in the same way.

63. The 13 small transistors furnished may have different body styles. The #042102 (or 2N2102) units will have metal bodies about 5/16" in diameter and about 1/4" high. Cut the three wires of these two transistors so that about 1/4" remains. Straighten the wires and plug them into sockets 33 and 34. Locate each wire in its socket hole and press gently but firmly straight down.

64A. The remaining 11 small transistors are marked #045000, six having a white paint mark on them. If these transistors are the same size as the ones in the previous step, trim the wires in the same way. If, however, they have smaller metal or plastic bodies with the wires emerging in a much closer pattern, then cut the wires so about 5/8" remains. You may find the wires are already this length. Since the wires are closer together, you will have to spread them enough to match the socket holes. When fully inserted, the transistor bodies will be about 3/8" above the socket. Rocking the transistor as you push down helps insertion. When inserting these smaller transistors make absolutely sure that the triangular pattern of the wires matches exactly the pattern of the socket holes. Now install the six white-marked units in sockets 48, 58, 67, 77, 86, and 96. Install the remainder in sockets 5, 19, 25, 114, 118. Check again to make sure the #042102 transistors are in sockets 33 and 34.

64B. The two transistor heat sinks are black, finned devices about 3/4" in overall diameter. These heat sinks will be installed over transistors 33 and 34. Place one of the heat sinks atop transistor 33 and center it. Hold the circuit board firmly, with one or more fingers directly under transistor socket 33 in order to support the board so you can press hard on top of transistor 33 without bending the board. Push the heat sink down over the transistor as far as it will go. The heat sink will expand like a spring as it goes over the transistor, and this spring action will keep it in place. If it seems difficult to get started, rock the heat sink a little to one side while applying downward pressure.

Install the remaining heat sink on transistor 34. If this heat sink touches a nearby capacitor, it will cause no harm.